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ABSTRACT

When 35 high school students read a short passage either with or without a meaningful context, those students who read the passage with a context recalled more of the passage. A think-aloud procedure revealed differences in processing during reading. Readers with a context relied more on prior knowledge to understand the text than did readers without a context. Readers with a context also made fewer attempts to represent the meaning, more attempts to compare text meaning with prior knowledge, and more attempts to construct new meaning. The improved recall for readers with a context replicated an earlier finding for listeners. (Author)

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Effects of Semantic Context on Thought Processes in Reading*

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Abstract

Thirty-five high school students read a short passage either with or without a meaningful context. Those who read the passage with a context recalled more of the passage. A think-aloud procedure revealed differences in processing during reading. Readers with a context relied more on prior knowledge to understand the text than did readers without a context. Readers with a context also made fewer attempts to represent the meaning, more attempts to compare text meaning with prior knowledge, and more attempts to construct new meaning. The improved recall for readers with a context replicated an earlier finding for listeners.

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Effects of Semantic Context on Thought Processes in Reading

Various characteristics of text, such as context, organization, and difficulty, have been shown to affect recall in predictable ways. Although many researchers are primarily interested in the thought processes underlying reading, research methods rarely give us access to the actual processes. In the absence of more direct evidence about the reading process, the nature of observed recall, which occurs after reading, is frequently used to make inferences about thought processes which were present during reading.

A new research method using a think-aloud procedure, originated by Yvonne Waern at the University of Stockholm, permits researchers to illuminate many reading processes. Waern has described her think-aloud technique and its development in several manuscripts. The technique encourages readers to verbalize their thoughts as they read, usually at the end of each sentence. The readers' comments are recorded and subsequently are categorized according to the thought processes which are indicated. The present study used the think-aloud procedure to elicit the thought processes which are associated with the contextual effects on recall found by Bransford and Johnson (1972).

Bransford and Johnson (1972) had college students listen to a passage about washing clothes which was difficult to understand without its title. Seventeen students listened to the passage without knowing the title; eighteen were given the title before listening to the passage. The students then wrote down what they could remember of the passage. The "title" group recalled significantly more than the "no title" group. Both groups presumably had equal prior knowledge

of washing clothes. Based upon these results, the authors suggested that prior knowledge is helpful for comprehension and for recall only if it is activated, as in the condition with the title present.

The think-aloud procedure which was used in the current study permits a more direct test of Bransford and Johnson's suggestion that readers with a context rely on prior knowledge more than readers without a context. The procedure also permits tests of hypotheses about thought processes during reading which were not considered by Bransford and Johnson.

In our model of thought processes during reading, there are two sources of input for the reader. One is the current text and the other is prior knowledge, which includes world knowledge as well as information from prior text. The simplest processing which a reader may reveal to an observer is an attempt at a representation of the meaning of a segment of text such as a sentence, Once a representation as accomplished, the reader may attempt to match (or compare) the representation with prior knowledge. For example, when a reader comments, "That's true," there has been a successful match between the text information and the reader's own beliefs of prior knowledge. Sometimes the reader will attempt at construct new meaning after a representation has occurred. That is, the reader may combine information from the text with information from prior knowledge, as illustrated by the reader of a mystery novel who says, "Ah! I bet the butler did it."

Although our model assumes that a representation must precede a match or a construction, the representation often occurs so easily and

automatically that the reader may only reveal an attempted match or construction. A reader who has difficulty representing the meaning of a text is more likely to be aware of the attempts at representation and is less likely to be able to attempt matches and constructions. One circumstance which may render representation more difficult is the case in which relevant world knowledge is unavailable as, for example, in Bransford and Johnson's experimental condition where readers were not given a title and therefore had no meaningful context for the passage.

Hypotheses The present study was designed to replicate Bransford and Johnson's study and to provide empirical evidence regarding which thought processes are associated with the two contextual conditions. Specifically, it was hypothesized that:

1. Readers with a context have greater recall than readers without a context;
2. Readers with a context make greater use of world knowledge than readers without a context;
3. Readers with a context are less likely than readers without a context to attempt consciously to represent the meaning of text sentences;
4. Readers with a context are more likely than readers without a context to attempt to match the text meaning with their prior knowledge;
5. Readers with a context are more likely than readers without a context to construct new meaning from the text and prior knowledge; and
6. Readers with a context are less likely to reread than readers without a context.

Methods The present study deviates from Bransford and Johnson's (1972) procedures in two important ways: reading was substituted for listening

and a think-aloud procedure was added. Thirty-five high school students volunteered to participate. The experiment was conducted in individual sessions with each student. As a warmup exercise for the think-aloud procedure, each student worked through a multiplication problem out loud. Each student then read the fifteen sentence passage on washing clothes which had been used by Bransford and Johnson. Ten students read the passage with the title; twenty-five read it without the title. Students commented on their thoughts as they read. The reading and comments were tape recorded. Then the students were asked to write down as much of the passage as they could recall. Each student's recall was scored leniently for evidence of the original sentences.

The tape recordings were transcribed, and all coding was done from the transcripts. Each reading and rereading of a sentence was coded as INTAKE. The comments were first divided into simple sentences and independent clauses. Then each of these units was classified according to the following scheme, in which each comment (coding unit) is either related to the meaning of the text or it is not related.

Some meaning-related comments indicate attempts at REPRESENTATION of the meaning of the text. An implicit or automatic attempt at representation, indicated by a comment such as, "I see," or "I don't understand," was coded <u>percept</u>. A paraphrase or other explicit representation was coded <u>Interpretation</u>. Other meaning-related comments may indicate attempts to MATCH text meaning with prior knowledge, for example, "I didn't know that," or "That's not what the author said before." A reader may attempt to match <u>current text</u> with his or her <u>world knowledge</u>

or with prior text. Comments may also indicate attempts at construction of new meaning from the text and prior knowledge. Construction may combine current text with world knowledge or with prior text, for example, "It's also the most dangerous mountain to climb," and "They must have dropped it from the bridge earlier." Three additional classifications are special cases where an attempt at construction leads to a statement of interest or disinterest, judgment, of value, or free association.

Some comments are NON-MEANING related. Such comments may be about style. They may indicate thoughts which control processing, such as, "I think I'll read that sentence again." Comments about the experimental task were coded meta.

Results Bransford and Johnson's (1972) finding of the effect of context on recall was replicated, in this case with reading rather than listening. The "context" and "no context" readers recalled a mean of 6.4 and 4.4 sentences respectively, $t(33) = 1.98$, $p < .03$, one-tailed.

The results of a multivariate analysis of variance are reported in Table I. In addition to the codes described earlier, the dependent measures included the total NUMBER of codes per protocol, excluding INTAKE.

The readers with no context did rely less on world knowledge than did readers with a context, as had been inferred by Bransford and Johnson, $F = 19.65$, $p < .001$. The readers with no context also made many more conscious attempts to represent the meaning of the text than

TABLE I
Multivariate analysis of variance of code frequencies
for the context and no context conditions

	Context Mean	No Context Mean	F	p /
INTAKE of text	15.80	16.72	2.75	.06[1]
REPRESENTATION of text meaning	7.70	11.60	11.20	.002[1]
percept	3.60	4.96	1.32	.26[2]
interpretation	4.10	6.64	3.87	.06[2]
MATCH: current text & prior knowledge	3.70	1.00	11.60	.001[1]
current text & world knowledge	3.50	.68	14.43	.001[2]
current text & prior text	.20	.32	.23	.64[2]
CONSTRUCTION: incl. int., assoc., & judg.	3.70	1.84	7.06	.006[1]
current text & prior knowledge	1.90	1.16	2.01	.17[2]
current text & world knowledge	.80	.32	2.01	.17[2]
current text & prior text	1.10	.84	.40	.53[2]
interest	.80	.16	7.45	.01[2]
association	.70	.28	3.16	.09[2]
judgment	.30	.24	.07	.80[2]
NON-MEANING related comments	.70	1.32	1.57	.22[2]
style	.60	.60	.00	1.00[2]
control	.00	.20	1.57	.22[2]
meta	.10	.52	2.75	.11[2]
NUMBER of codes, excluding INTAKE	15.90	15.92	.00	.99[2]
All classifications above which involve:				
world knowledge including interest, assoc., & judg.	6.10	1.68	19.65	.001[1]
excluding interest, assoc., & judg.	4.30	1.00	14.10	.001[1]
prior text	1.30	1.16	.07	.80[2]

[1] one-tailed

[2] two-tailed

did readers with a context, $F = 11.20$, $p < .002$. Readers with no context had significantly fewer matches and constructions than did the readers with a context, $F = 11.60$, $p < .001$, and $F = 7.06$, $p < .006$, respectively.

The one hypothesis which was not confirmed was that readers with no context would do more rereading. They did do twice as much rereading, 1.72 sentences as compared with .80 sentences for readers with a context, but the difference was not quite statistically significant.

Discussion In addition to replicating Bransford and Johnson's (1972) finding of the effect of context on recall, this study found empirical evidence for the effect of context on the use of world knowledge, which had been hypothesized earlier but tested only indirectly. The think aloud procedure which permitted the verification of the thought process hypothesized by Bransford and Johnson also permitted the verification of new hypotheses about the reading processes which are associated with the two different contextual conditions.

The difference in recall between the context and no context conditions was statistically significant but not of the magnitude found by Bransford and Johnson. Listeners in the context condition had approximately a 100% advantage in recall over listeners in the no context condition, whereas readers in the context condition had only a 50% advantage. Conscious rereading and unconscious visual regression may have enabled readers to reduce the disadvantage of being in the no context condition. In spite of only moderately significant differences in recall, there were very significant differences in the thought processes during reading,

as revealed by the think aloud procedure. More sophisticated readers, such as college students, may be able to reduce or eliminate the disadvantage in recall for the no context condition, but the differences in thought processing are not likely to disappear.

The findings to date suggest that some students who have problems understanding and recalling text may not have deficiencies in their listening and reading skills; their difficulties in comprehension and recall may be attributable to the unavailability of relevant prior knowledge, either because the information is not known or because its relevance is not know.

The think aloud technique appears to have potential for revealing thought processes during reading. The technique is still being refined as we gain experience from this experiment and from others that are in progress. We are exploring, for example, the possible benefits of separating comments which indicate representations into three classifications according to the reader's expression of success, failure, or uncertainty about each representation. As we improve upon the balance between the conceptual validity and the reliability of the classification scheme, we expect that the think aloud technique will be useful for studying reading under a variety of textual conditions and a variety of reader characteristics.

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